west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone (304) 926-0475 • FAX: (304) 926-0479

Jim Justice, Governor
Austin Caperton, Cabinet Secretary
www.dep.wv.gov

ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-1856B
Plant ID No.:	099-00013
Applicant:	Columbia Gas Transmission, LLC
Facility Name:	Ceredo Compressor Station
Location:	Near Ceredo, Wayne County
SIC/NAICS Code:	4922/486210
Application Type:	Modification
Received Date:	May 5, 2017
Engineer Assigned:	Joe Kessler
Fee Amount:	$1,000
Date Received:	May 5, 2017
Complete Date:	June 5, 2017
Due Date:	September 3, 2017
Applicant Ad Date:	May 2, 2017
Newspaper:	*The Herald-Dispatch*
UTM's:	366.1 km Easting • 4,247.7 km Northing • Zone 17
Latitude/Longitude:	38.36877/-82.53238
Description:	Changing the model of the permitted (but not installed) emergency generator (005G4) from an 880 horsepower (hp) Waukesha VGF L36GL to a 1,175 hp Waukesha VGF-P48GL.

Columbia Gas Transmission, LLC's (CGT) Ceredo Compressor Station was constructed in the early 1950's and was, therefore, at the time the minor and major source permitting rules (45CSR13 and 45CSR14) were promulgated, considered a grandfathered source. However, since that time the station has undergone two modifications that have required a permit under 45CSR13:

- On July 17, 1995, R13-1856 was issued to CGT for the installation of a 738 hp auxiliary generator; and

- On August 16, 2016, R13-1856A was issued to CGT to: (1) replace two (2) existing grandfathered combustion turbines (E08 and E09) with one (1) new 30,399 horsepower (hp) Solar Titan 250 combustion turbine, (2) to install one (1) 880 hp Waukesha VGF L36GL emergency generator, and (3) install one (1) additional 1.0 mmBtu/hr process heater.

Additionally, several "no permit needed" determinations have also been made for various auxiliary equipment added to the facility.

DESCRIPTION OF PROCESS/MODIFICATIONS

Existing Facility Description

CGT's Ceredo Station is located near Ceredo, Wayne County, WV. The station receives natural gas via pipeline from an upstream compressor station, compresses it using natural gas-fired turbines and reciprocating internal combustion engines (RICE), and then transmits it via pipeline to a downstream station. The station's compression stock currently consists of:

- Six (6) 2,800 hp natural gas-fired Cooper-Bessemer GMWH-8 2-stroke lean burn (2SLB) compressor engines (installed from 1954 through 1960);
- One (1) 2,700 hp natural gas-fired Cooper-Bessemer 8V-250 2-stroke lean burn (2SLB) compressor engine (installed in 1965); and
- One (1) 30,399 hp natural gas-fired Solar Titan 250 combustion turbine (installed in 2016).

Auxiliary equipment at the facility includes one (1) 738 hp natural gas-fired Waukesha F3521GL emergency generator (1996), one (1) 0.375 mmBtu/hr natural gas-fired fuel gas heater (1998), one (1) 6.276 mmBtu/hr natural gas-fired boiler (2012), and numerous storage tanks for various low vapor pressure liquids. An 880 hp natural gas-fired Waukesha VGF-L36GLEmergency Generator was permitted in 2016 but has not been installed.

Proposed Modifications

CGT is now proposing to modify the Ceredo Compressor Station by changing the model of the permitted (but not installed) emergency generator (005G4) from an 880 hp Waukesha VGF-L36GL to a 1,175 hp 4-Stroke Lean Burn (4SLB) natural-gas-fired Waukesha VGF-P48GL.

SITE INSPECTION

Due to the nature of the proposed modification, the author did not perform a site inspection of the facility for this permitting action. The facility was last inspected by DAQ Compliance/ Enforcement (C/E) Inspector Mr. Andy Grimm on January 19, 2017. This inspection found the facility be "Status 30 - In Compliance."

AIR EMISSIONS AND CALCULATION METHODOLOGIES

CGT provided calculations of the post-modification facility-wide potential-to-emit (PTE) in Attachment N of the permit application. The following will only summarize the air emissions and calculation methodologies of the emission sources being added or modified as part of this permitting action.

Emergency Generator

Potential emissions from the new 1,175 hp 4SLB natural-gas-fired Waukesha VGF-P48GL emergency generator (G4) were based on emission factors provided by the engine vendor, as given in AP-42, Section 3.2., and on the applicable 40 CFR 60, Subpart JJJJ limitation. Hourly emissions were based on the (as calculated using a fuel heat rating of 7,733 Btu/hp-hr) maximum design heat input (MDHI) of the engine of 9.09 mmBtu/hr and the maximum hp rating. Annual emissions were based on 500 hours of operation per year. The following table details the PTE of the compressor engine:

Table 1: Waukesha VGF-P48GL Emergency Generator PTE

Pollutant	Emission Factor	Source	Hourly (lb/hr)	Annual (ton/yr)
CO	4.00 g/hp-hr	40 CFR 60, Subpart JJJJ	10.36	2.59
NO_X	2.00 g/hp-hr	40 CFR 60, Subpart JJJJ	5.18	1.30
$PM_{2.5}/PM_{10}/PM^{(1)}$	9.91×10^{-3} lb/mmBtu	AP-42, Table 3.2-2	0.09	0.02
SO_2	5.71×10^{-2} lb/mmBtu (hourly) 7.1×10^{-4} lb/mmBtu (annual)	20 gr-S/100 scf (hourly) 0.25 gr-S/100 scf (annual)	0.52	<0.01
VOCs	1.00 g/hp-hr	40 CFR 60, Subpart JJJJ	2.59	0.65
Total HAPs	Various	AP-42, Table 3.2-2	0.67	0.17
Formaldehyde	0.19 g/hp-hr	Engine Vendor	0.49	0.12

(1) Includes condensables.

Post-Modification Facility-Wide Emissions

The following table details the proposed post-modification facility-wide emissions of the Ceredo Compressor Station.

Table 2: Facility-Wide Post-Modification Annual (ton/yr) Emissions

Source	CO	NO_x	$PM^{(1)}$	SO_2	VOCs	HAPs
Cooper-Bessemer GMWH-8 Engine	35.08	491.79	4.98	0.07	12.36	8.19
Cooper-Bessemer GMWH-8 Engine	35.08	491.79	4.98	0.07	12.36	8.19
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Cooper-Bessemer GMWH-8 Engine	35.08	491.79	4.98	0.07	12.36	8.19
Cooper-Bessemer GMWH-8 Engine	35.08	491.79	4.98	0.07	12.36	8.19
Cooper-Bessemer GMWH-8 Engine	35.08	491.79	4.98	0.07	12.36	8.19
Cooper-Bessemer 8V-250 Engine	39.03	591.30	4.46	0.07	11.07	7.34

Source	CO	NO_x	PM[1]	SO_2	VOCs	HAPs
Solar Titan 250 Turbine	54.65	35.67	6.44	0.70	6.03	1.00
Waukesha Emergency Generator 3	1.08	0.61	0.01	<0.01	0.41	0.11
Waukesha Emergency Generator 4	2.59	1.30	0.02	<0.01	0.65	0.17
Fuel Gas Heater H1	0.14	0.16	0.01	<0.01	0.01	0.01
Process Heater H3	0.36	0.43	0.03	<0.01	0.02	0.01
Heating System Boiler BL3	2.26	2.69	0.20	0.02	0.15	0.05
Fugitives	0.00	0.00	0.00	0.00	4.37	0.00
Facility-Wide Totals[2] ➜	**310.59**	**3,582.90**	**41.05**	**1.25**	**96.87**	**57.83**

(1) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
(2) Small differences between the facility-wide totals here and in Attachment N of Permit Application R13-1856B are due to rounding differences and are not substantive.

Facility-Wide Emissions Increase

The following table lists the proposed changes in facility-wide emissions at the Ceredo Compressor Station as a result of the modifications discussed herein:

Table 3: Change in Facility-Wide Post-Modification Annual (ton/yr) Emissions

Source	CO	NO_x	PM[1]	SO_2	VOCs	HAPs
R13-1856A	309.93	3,582.56	41.05	1.25	96.71	57.79
R13-1856B	310.59	3,582.90	41.05	1.25	96.87	57.83
Change in Emissions ➜	**0.66**	**0.34**	**0.00**	**0.00**	**0.16**	**0.04**

(1) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.

REGULATORY APPLICABILITY

This section will address the potential regulatory applicability/non-applicability of substantive state and federal air quality rules relevant to the emission units/sources added or modified at the Ceredo Compressor Station.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The proposed modification of the Ceredo Compressor Station does not have the potential to increase the emissions of a regulated pollutant in excess of the thresholds that would, pursuant to §45-13-2.17, define the changes as a "modification" under 45CSR13. Therefore, the proposed changes would normally be eligible to be reviewed as a Class II Administrative Update. However,

CGT voluntarily submitted the application as a modification (based on the need to re-evaluate the PSD Applicability Analysis submitted under R13-1856A) and it was reviewed as such. Pursuant to §45-13-5.1, "[n]o person shall cause, suffer, allow or permit the construction, modification, relocation and operation of any stationary source to be commenced without . . . obtaining a permit to construct."

As required under §45-13-8.3 ("Notice Level A"), CGT placed a Class I legal advertisement in a "newspaper of general circulation in the area where the source is . . . located." The ad ran on May 2, 2017 in *The Herald-Dispatch* and the affidavit of publication for this legal advertisement was submitted on June 5, 2017.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration (Non-Applicability)

The Ceredo Compressor Station is an existing major stationary source under 45CSR14 and the modifications made under R13-1856A were considered, pursuant to §45-14-2.40, a "*physical change* or a change in the method of operation." Therefore, submitted as part of that application was a PSD Applicability Analysis that showed that the changes proposed under R13-1856A were not defined as a "major modification" and that PSD review did not apply. As the proposed emergency generator model change proposed herein represents a modification of the changes proposed under R13-1856A, the following will represent an amended retroactive PSD Applicability Analysis based on the revised "project" - in this case representing the modifications proposed under R13-1856A but with the revised emergency generator model as part of the project.

To determine if the project was defined as a "major modification," pursuant to §45-14-3.4(a), the project was examined under a two-step applicability test: "[A] project is a major modification for a regulated NSR pollutant if it causes two types of emissions increases -- a significant emissions increase (as defined in subsection [§45-14-2.75]), and a significant net emissions increase (as defined in subsections [§45-14-2.46] and [§45-14-2.74]). The proposed project is not a major modification if it does not cause a significant emissions increase. If the proposed project causes a significant emissions increase, then the project is a major modification only if it also results in a significant net emissions increase."

Therefore, for the project to meet the definition of a major modification, the changes themselves must result in a significant emissions increase. The methodology for calculating the emissions increase under the first step is given under Sections §45-14-3.4(b), 3.4(c), 3.4(d) and 3.4(f). The substantive language relevant to the changes evaluated herein is given below:

> [§45-14-3.4(b)]
> The procedure for calculating (before beginning actual construction) whether a significant emissions increase (i.e., the first step of the process) will occur depends upon the type of emissions units being modified, according to subdivisions 3.4.c through 3.4.f.
>
> [§45-14-3.4(d)]
> Actual-to-potential test for projects that only involve construction of a new emissions unit(s). -- A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit (as defined in subsection 2.58) from each new emissions unit following completion of the project and the baseline actual emissions (as defined in subdivision 2.8.c) of these units before the project equals or exceeds the significant amount for that pollutant (as defined in subsection 2.74).

The total PTE associated with the proposed installation of the new combustion turbine, new emergency generator model, and process heater are given in the following table:

Table 4: PTE From Installation of New Equipment

Source	CO	NO_x	PM(1)	SO_2	VOCs
Solar Titan 250 Turbine	54.65	35.67	6.44	0.70	6.03
Waukesha VGF- P48GL Emergency Generator	2.59	1.30	0.02	<0.01	0.65
Process Heater H3	0.36	0.43	0.03	<0.01	0.02
Physical Change Totals ➜	**57.60**	**37.40**	**6.49**	**0.72**	**6.70**

(1) All particulate matter emissions are assumed to be less than 2.5 microns. Includes condensables.
(2) Pursuant to 45CSR14 and DAQ policy, PTE used in a PSD Applicability Analysis does not include fugitive emissions for an "unlisted" source.

Therefore, the aggregate PTE from the project's emissions is less than the significant thresholds that would the define the project as a "major modification" under §45-14-2.74 and 45CSR14 does not apply.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The Ceredo Compressor Station, defined under Title V as a "major source," was last issued a Title V permit on October 31, 2012. Proposed changes evaluated herein must also be incorporated into the facility's Title V operating permit. Commencement of the operations authorized by this permit shall be determined by the appropriate timing limitations associated with Title V permit revisions per 45CSR30.

40 CFR 60 Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.

CGT's proposed 1,175 hp 4SLB natural-gas-fired Waukesha VGF-P48GL emergency generator is defined under 40 CFR 60, Subpart JJJJ as stationary spark-ignition internal combustion engines (SI ICE) and is, pursuant to §60.4230(a)(4)(iv), subject to the applicable provisions of the rule. Pursuant to §60.4233(e): "Owners and operators of stationary SI ICE with a maximum engine power greater than or equal to 75 KW (100 HP) (except gasoline and rich burn engines that use LPG) must comply with the emission standards in Table 1 to this subpart for their stationary SI ICE." Therefore, as CGT's proposed new emergency generator is greater than 100 hp, the engine must comply with the emission standards under Table 1 for "Emergency ≥ 130 hp:" NO_x - 2.0 g/HP-hr, CO - 4.0 g/HP-hr, and VOC - 1.0 g/HP-hr. The emission standards and the proposed compliance therewith of the engines are given in the following table:

Table 5: Waukesha VGF-P48GL Subpart JJJJ Compliance

Pollutant	Standard (g/HP-hr)	Uncontrolled Emissions (g/bhp)	Control Percentage	Controlled Emissions (g/bhp)(1)	JJJJ Compliant?
NO_x	2.0	2.00	n/a	n/a	Yes
CO	4.0	4.00	n/a	n/a	Yes
VOC(1)	1.0	1.00	n/a	n/a	Yes

(1) Pursuant to Subpart JJJJ, VOC emissions do not include CH_2O emissions.

Use of an emergency engine further requires compliance with the operating requirements given under §60.4243(d). In accordance with §60.4243(a)(2)(iii), since this engine is not certified, an initial performance test is required within one year of startup. Subsequent performance testing is required every 8,760 hours of operation or every three years, whichever comes first.

40 CFR 63 Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The proposed 1,175 hp 4SLB natural-gas-fired Waukesha VGF-P48GL emergency generator is subject to the NESHAP for stationary RICE. The proposed engine is an 1,175-hp emergency generator which will not, and is not contractually obligated to, be available for more than 15 hours per calendar year for emergency demand response programs and voltage deviation as described in §63.6640(f)(2)(ii) and (iii). Pursuant to §63.6359(b)(i), as a new emergency stationary RICE with a site rating greater than 500 bhp at a major source of HAPs (see Table 2) which does not operate for these purposes, the proposed engine does not have to meet the requirements of Subpart ZZZZ and Subpart A except for the initial notification requirements in 40 CFR 63.6645(f).

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides general toxicity information for those regulated pollutants that may be increased from the proposed changes in substantive amounts and that are not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), and Sulfur Dioxide (SO_2). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration standards, are regulated through various federal and state programs designed to limit their emissions and public exposure. These programs include federal source-specific HAPs regulations promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Any potential applicability to these programs to the modified emission unit were discussed above under REGULATORY APPLICABILITY.

The majority of non-criteria regulated pollutants fall under the definition of HAPs which, with some revision since, were 188 compounds identified under Section 112(b) of the Clean Air Act

(CAA) as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The requested changes evaluated herein will result in a small increase of potential formaldehyde emissions from the new model of engine. The following table lists formaldehyde's general carcinogenic risk as based on analysis provided in the Integrated Risk Information System. EPA's Integrated Risk Information System (IRIS) is a human health assessment program that evaluates information on health effects that may result from exposure to environmental contaminants. For a complete discussion of the known health effects of formaldehyde, and the underlying studies supporting these assessments, refer to the IRIS database located at *www.epa.gov/iris*.

Table 6: Potential HAPs - Carcinogenic Risk

HAPs	Type	Known/Suspected Carcinogen	Classification
Formaldehyde	VOC	Yes	B1 - Probable Human Carcinogen

All HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle (e.g., smoking). As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*.

AIR QUALITY IMPACT ANALYSIS

The proposed modification does not meet the definition of a "major modification" pursuant to 45CSR14 and, therefore, an air quality impact (computer modeling) analysis was not required. Additionally, based on the nature of the proposed modification, modeling was not required under 45CSR13, Section 7.

MONITORING, COMPLIANCE DEMONSTRATIONS, RECORD-KEEPING, AND REPORTING REQUIREMENTS

There were no changes to the permitted monitoring, compliance demonstration, record-keeping, and reporting requirements that are given under 4.2.1. of the draft permit.

PERFORMANCE TESTING OF OPERATIONS

There were no changes to the performance testing requirements as given under 4.3.1. of the draft permit.

CHANGES TO PERMIT R13-1856A

Substantive changes to permit R13-1856A are limited to the following:

- Revising the emergency generator model type and design capacity (and correcting other small errors in identification numbers for other units) in Emission Units Table 1.0.; and

- Revising the emergency generator model type and emission limits under 4.1.3.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable state and federal air quality regulations will be achieved. Therefore, I recommend to the Director the issuance of Permit Number R13-1856B to Columbia Gas Transmission, LLC for the above discussed changes to the Ceredo Compressor Station located near Ceredo, Wayne County, WV.

Joe Kessler, PE
Engineer

Date